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Emilio Salgari and the Energy Harvesting from Gulf Stream

Amelia Carolina Sparavigna[1]

Department of Applied Science and Technology, Politecnico di Torino, Italy

Abstract: Some researchers and engineers are hoping to harvest renewable energy by means of sea turbines, placed, for instance, in the oceanic currents. Recently, in March 2014, it was announced that some first tests have also been conducted in the Gulf Stream off Florida's coast. In this paper, we will see that the hope for energy harvesting from this oceanic current is not recent, but it is, at least, a hundred-year-old. In fact, we find the description of mills in the Gulf Stream in a novel, entitled "The Wonders of 2000", written by Emilio Salgari (1862 – 1911), Italian adventure writer and pioneer of science fiction.

Keywords: Science Fiction, Emilio Salgari, Energy Harvesting, Gulf Stream, Oceanic Currents

1. Introduction

The history of energy harvesting from wind and water is quite old. The invention of the watermill seems to have occurred in the Eastern Mediterranean region, after the rise of Hellenistic science and technology, following the conquests of Alexander the Great [1]. A Greek engineer, Heron of Alexandria in the first century AD, is credited of the earliest known design of using a wind-driven wheel to power a machine [2,3]. Heron is also credited of the project of the first steam machines [4].

Today, besides wind and sun, scientists and engineers are searching for new devices, able to gain energy from other natural sources, such as, for instance, tides and oceanic currents. One of the proposed manner is that of harvesting the kinetic energy of the Gulf Stream, the huge Atlantic current meandering clockwise from the Gulf of Mexico toward Europe. In fact, the Southeast National Marine Renewable Energy Center, of the Florida Atlantic University, had recently conducted the first at-sea tests of its research oceanic turbine offshore Fort Pierce [5]. Engineers are hoping for renewable energy obtained by means of these sea turbines, but environmentalists are concerned about their impact on marine life [6].

The several patent applications, which are proposing installations for harvesting ocean currents (see for instance [7]), demonstrate that many researches had been made and continue on this subject. The aim of them is that of having devices capable of harvesting the kinetic energy of ocean currents in deep waters, using, for instance, semisubmersible platforms and hydraulic turbines. In [7], turbines are located below the sea level, but electric power generators are on a structure above the water and transmit the produced electric power using some flexible cables from generators to the sea bottom and then some underwater cables to reach the shore.

In fact, the idea of harvesting energy from the Gulf Stream is not new, but it is at least 100-year-old. We find it in a novel written by Emilio Salgari. Salgari (1862 – 1911) was an Italian writer of adventures and a pioneer of science fiction. Until quite recently, his novels were mandatory reading for generations of young people. Therefore, in Italy, Salgari's body of work is very popular and more widely read than that of Dante Alighieri.

In a novel entitled "The Wonders of 2000", published in 1907, we find how Salgari imagined the beginning of the new millennium. Among other things, we have the description of the hydropower plants for extracting energy from the Gulf Stream. Let us see how the writer described them, but before some words about life and works of Salgari.

2. Life and works

Emilio Salgari was born in Verona. From his young age, he desired to explore the world and started attending the Naval Academy in Venice, but he never graduated. In fact, he began to work as a reporter on the daily "La Nuova Arena", which published some of his novels as serials. In fact, Salgari had never ventured farther than the Adriatic Sea, but he turned his passion for exploration and discovery in writing of them in his works. Though knighted by the Kingdom of Italy (Cavaliere dell'Ordine della Corona d'Italia, 3 April 1897) and popular, Salgari, unfortunately, did not earn much money from his books and his private life was clouded by several tragedies [8].

✉ amelia.sparavigna@polito.it

Salgari wrote more than 200 adventure stories and novels, setting his tales in exotic locations, with heroes from the entire world, gaining inspiration in the reading of foreign literature and newspapers, travel magazines and encyclopedias [8]. He wrote four major series: The Pirates of Malaysia, The Black Corsair Saga, The Pirates of Bermuda, and adventures of the Old West. Salgari's heroes were mostly pirates, outlaws and barbarians, fighting against greed, abuse of power and corruption [8]. Sandokan, The Tiger of Malaysia, is his most popular and beloved hero. In the successful 1976 TV miniseries, Kabir Bedi portrayed him. After the broadcasting of the series, Bedi became the quintessence of this character.

3. The Wonder of 2000

Salgari wrote a novel, which is entitled "Le Meraviglie del Duemila", that is "The Wonders of 2000", where he is describing the future society and also how this society is gaining its energy from oceans. Le Meraviglie del Duemila was written in 1907 [9]: being a novel of science fiction, it is among the first of this genre in Italian. First published by Bemporad Editor, for contractual reasons under the pseudonym Guido Altieri, it was later expanded and published again [10].

Salgari describes a journey into the future: the plot is the following. Two men, James Brandok and Toby Holker, thanks to the discovery of an active ingredient from an exotic plant that suspends the vital functions, are able to travel in time, kept in a sort of hibernation in a bunker near New York, from 1903 to 2003. They are awake by a Holker's grandchild, and they had to start living again in a very different society. They find a world populated by flying machines, underground trains and underwater cities. The life, in a hundred of years, is so different that Brandok and Toby end in a mental hospital because they cannot stand it. The influence of electricity on their nervous system is the reason of the collapse of the two men, because they have not adaptation to the electric emanations of future devices and plants [9,10].

The novel describes some technological advances such as television and fax (fax was existing and in use at Salgari's time), and also plastic, described as a strange white metal-like substance (celluloid had already been discovered since 1860) [10]. How is people obtaining energy for all these wonderful things? Energy is harvested by mills from oceanic currents. In the following the reader can find a translation of the parts of the Salgari's novel referring to the mills in the Gulf Stream.

4. The mills in the Gulf Stream

Our friends, Holker (Toby's grandchild), Brandok and Toby, had travelled to a polar colony and aim to move toward Europe. After three days spent in the colony, the morning of the fourth day they were aware that, during the night, an electric train arrived from Spitzbergen. The train was ready to return to Europe. "Let's go, friends." said Holker. "When will we arrive to Spitzbergen?" asked Brandok. "In sixty hours, being the European tunnel longest than the American tunnel." "And then, where will we go?" "We will board the flying vessel between the Islands and England. During the travel, I'll show you another wonder." "Which one?" "The great mills in the Gulf Stream."

In fact, fifty hours later, the three travelers arrived safely on the northern coast of Spitzbergen Island. The next day, early in the morning, the flying vessel appeared on the horizon. It looked like those flying omnibuses, that Brandok and Toby had already seen in New York City, but larger. Travelers boarded the flying machine, the Centaur.

"When we come to London?" asked Toby, "In forty-six hours" said the captain. But before, they have to reach an underwater city near the coasts of Ireland. "That's a good opportunity to visit the city," said Holker "and even the huge mills in the Gulf-Stream. Never thought we could be so lucky!" Eighteen hours later, the Centaur reached the Gulf Stream one hundred and twenty miles north of Madeira Island.

"Now you'll see another of the most marvelous inventions of our scientists, - said Holker - you will see what profit men of the third millennium are gaining from this great stream that men of your time neglected. It seems impossible that your scientists never dealt with such an immense force in these waters". Then Toby asks, "What have you done with this river in the ocean? You told about mills." "Yes, uncle, - Holker answered - as you know, all our machines are powered by electricity, so we need a huge force from gigantic dynamos. North America has its famous waterfalls, the South, its numerous rivers. Europe a few streams with poor waterfalls, so it is insufficient. Therefore, what have the scientists thought? They have resorted to the Atlantic Ocean and have fixed their eyes on the Gulf Stream. And, in fact, an immense force can be drawn from this stream! They built huge floating islands, made of steel, equipped with huge wheels similar to those of your old mills, and towed up to the Gulf Stream, mooring them firmly. Nowadays there are more than two hundred, spread out near the coasts of Europe and almost as many in the Gulf of Mexico, with a mandate to administer, with almost no expenditure, the force required by factories in Central America and also in the northern coast of Guyana, Venezuela,

Columbia and Brazil." "How is the force transmitted? By overhead wires?" "No, uncle, with submarine cables, similar to those that you used for transatlantic telegraphy." "What is the speed of the Gulf Stream?" asked Brandok "Five to eight km/h," said Holker. "Can those islands resist hurricanes?" "Each one is strongly moored and even if one broke its moorings, the men on them who are in charge of surveillance run no risk, since those islands, or rather, vast vessels are unsinkable." "And each of them how much force can provide?" "A million horsepower."

Emilio Salgari is aware of possible problems and then we find Brandok asking, "Mr. Holker, over the last hundred years, has the current of the Gulf Stream suffered any diversion?" "Why do you ask me that question?" "Because in our time, it was feared that the creation of Panama Canal could produce a shift in the current, due to the pressure of Pacific Ocean waters" "No sir. - said Holker - Who could divert such a huge stream?" "And does the English coasts continue to feel the beneficial effects of the heat carried by this current?" "If it were not so, Ireland, Scotland and England would have been turned into polar lands, being at the same latitude of Siberia."

During this discussion, the three men had arrive near the floating island N.7. "This is the most gigantic mill of England," said Holker. Three or four miles apart from this island, they could see a high antenna, colored in red. "The aerial antenna for telegraphy" said Holker. "Have all the mills it?" Said Brandok. "Yes, and what a precaution! If a storm moves the floating island and this is dragged away, a dispatch is sent to the nearest station and the most powerful available tugs hasten to bring the island back at its place."

The Centaur was moving very fast, helped by the current of the Gulf Stream too, which was favoring it, and, in short time, the vessel found itself in the waters of mill N.7. As Holker had already explained, it was an enormous floating platform of steel. This platform had a circular shape, with a circumference of 400 meters, provided in its center of four huge wheels that the current were running with remarkable speed. Between the wheels, there were four one-floor houses, made of iron, equipped with lightning rods; one was for food storehouse of the crew. There were four landing stages on the sea, provided each of the crane supporting a lifeboat.

5. The Gulf Stream

This was Salgari's description of one of the platforms with dynamos in the oceanic current. About the Gulf Stream, Emilio Salgari writes that this is a gigantic river, flowing across the Atlantic Ocean without mixing its waters with those surrounding it from all sides. “In no other part of our globe, there is a current so wonderful. It has a flow more rapid than that of Amazon River, more impetuous of Mississippi River, and the flow rates together of these two rivers, which are considered the largest of the world, do not reach a thousandth part of the volume of water, which is flowing daily in this current”. The sailors call it the “river of the sea”; it has its origin from the Caribbean Sea, “travels around the Gulf of Mexico, hurls in the Atlantic Ocean, rises northward first, then bends eastward, touches the shores of Europe, keeping intact the warm waters that it is dragging along in a journey of thousands and thousands leagues” [9].

The name “Gulf Stream” is coming from Benjamin Franklin. When he was in England in 1768, Franklin became interested in the North Atlantic Ocean circulation patterns after he heard a complaint for some problems concerning the voyages from and to England, at the Colonial Board of Customs [11]. Franklin questioned his cousin Timothy Folger, a Nantucket whaler captain. Folger told him that merchant ships routinely avoided a strong eastbound mid-ocean current, adverse to their voyage. Franklin worked with Folger and other experienced captains, charted the current and named it the Gulf Stream. Franklin published his Gulf Stream chart (Figure 1) in 1770 in England, where it was completely ignored [11]. Subsequent versions were printed in France in 1778 and the U.S. in 1786.

In 1853, Matthew Fontaine Maury oceanographer and cartographer, noted that Franklin only charted and codified the Gulf Stream, but he had not discover it [11,12]. The first mention of the Gulf Stream is coming from 1513 expedition of Juan Ponce de León. On April 22, 1513, he wrote in his voyage log: "A current such that, although they had great wind, they could not proceed forward, but backward and it seems that they were proceeding well; at the end it was known that the current was more powerful than the wind" [13]. And six years after this notation, Anton de Alaminos sailed from Vera Cruz, Mexico, to Spain using the Gulf Stream: he followed the Florida coastline northward before turning eastward to Europe. In fact, as told in [13], he was the chief pilot aboard Ponce de Leon's ship on his earlier trip and he also travelled with Columbus on his last voyage. Anton de Alaminos was the first to take advantage of the Gulf Stream. Its existence was known to explores Peter Martyr d'Anghiera and Sir Humphrey Gilbert too [11].

6. About energy harvesting and recent experiments

The idea of energy harvesting from the Gulf Stream was probably older that the description of the mills given by Salgari in his novel. However, this is the first description of such devices I was able to found. As previously told, Salgari wrote his stories and

novels, gaining information on science and technology from foreign literature and magazines too. Then, it is possible that this idea had been already proposed in some magazine.

In addition, what about the power Salgari imagined to gain from the mills? In Ref.14, it is told that, about 1980, the National Oceanic and Atmospheric Administration (NOAA) considered to place some river mills in the Gulf Stream, between Bimini and Florida, moored at a depth of 30 to 120 m. NOAA reckoned that such mills could extract about four per cent of the 25 GW available in the top 100 meters of the stream. It means 250 MW. Another possibility is to place turbines on the ocean floor [14]. Now [5,15], for the team at Florida Atlantic University (FAU), an area of the Atlantic Ocean, approximately thirteen miles off Fort Lauderdale, is the location for a first experiment testing water-powered turbines. The researchers are testing the equipment so that the flow of water spins a propeller, producing electricity. However, concerns exist about the effects of spinning blades on underwater life. Turbines can kill fishes and turtles, such as the wind turbines are killing birds.

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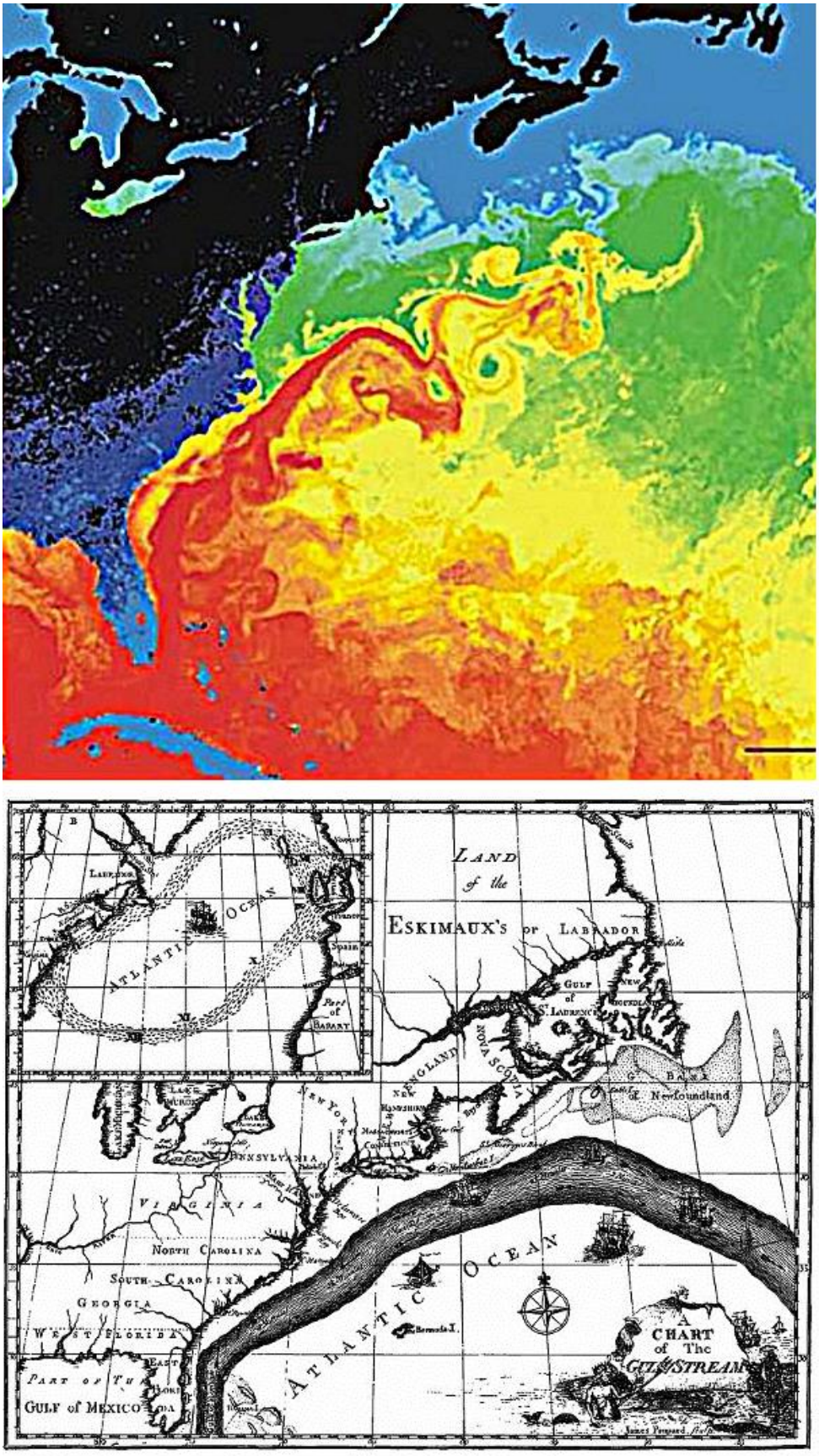

Figure 1 – The chart prepared by Benjamin Franklin of the Gulf Stream, compared to a NASA thermal map of it.